

Project Title: Hydrocarbon Data Analysis, Interpretation, and Database Maintenance for Restoration and NRDA Environmental Samples Associated with the *Exxon Valdez* Oil Spill

Project Number:	00290
Restoration Category:	Service Project
Proposer:	Bonita D. Nelson and Jeffrey W. Short NMFS, Auke Bay Laboratory ABL Program Manager: Dr. Stan Rice NOAA Program Manager: Bruce Wright
Lead Trustee Agency:	NOAA
Cooperating Agencies:	None
Alaska SeaLife Center:	No
Duration:	Service Ongoing
Cost FY 00:	59.3
Cost FY 01:	35.0
Cost FY 02:	35.0
Geographic Area:	Not Applicable
Injured Resource/Service:	Maintenance of the Trustee hydrocarbon database, archival of environmental samples, interpretative services

ABSTRACT

This project is a continuation of the NRDA and Restoration database management, sample storage, and interpretive service. New data will continue to be incorporated into the Trustee hydrocarbon database. Updated summary report for investigators and managers will be produced along with an electronic copy of the data for all data queries. A database for pristane sample collection and analysis information will be maintained and a database will be initialed for fatty acid/lipid class composition sample collection and analysis for ABL Trustee funded projects.

INTRODUCTION

The Auke Bay Laboratory provides data and sample archiving services for all samples collected for hydrocarbon analysis in support of *Exxon Valdez* Trustee Council projects. These data represent samples collected since the oil spill in 1989 to the present and include environmental and laboratory Response and Restoration data. Additionally, we provide interpretive services for the hydrocarbon analyses. Currently, the database contains results of the hydrocarbon analysis of more than 13,000 samples and collection information from more than 47,000 sediments, tissues, water, or oil samples. The primary purpose of this project is to maintain the integrity of the database, incorporate new data and continue hydrocarbon data interpretive services. This year we are proposing to continue the task of maintaining a pristane database and generate a fatty acid/lipid class database for Trustee funded projects at the Auke Bay Laboratory. The second purpose is to make the results of the hydrocarbon analyses available to principal investigators, resources managers and to the public. This service is expected to have activity through synthesis period of the next one year. The third purpose of this project is to maintain the integrity of archived samples in freezers many of which have not yet been analyzed for hydrocarbons.

The Trustee hydrocarbon database not only contains sample collection and hydrocarbon analyses information, but also has data concerning sample shipping and location information as well as lists of other database identifiers (such as species and location codes). A public version of this database containing the sample collection and environmental hydrocarbon sample analyses was released in 1996 (*Exxon Valdez* Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database 1989-1995 -EVTHD). Updating the database is an on-going program, samples from Chenega cleanup (98291) final analysis (98291) were added in 1998 and samples collected from mussel beds are projected to be added in 1999 as well as any other samples collected from Trustee projects submitted for FY2000.

The hydrocarbon interpretive service is designed specifically for investigators and managers. This includes: (1) identification of the probable sources of the hydrocarbons observed in the samples, (2) evaluation of new hydrocarbon data for evidence of systematic bias, (3) hydrocarbon data editing according to consistent criteria. Recently interpretation has grown to include identification of potential hydrocarbon sources (e.g. coal) for the background hydrocarbon signal in PWS. This is a continuation of project 98290 and previously funded under TS#1, 93090, 94290, 95290, 96290, 97290, 98290 and 99290.

NEED FOR THE PROJECT

A. Statement of Problem

The Trustee hydrocarbon database is a dynamic structure which requires updating and maintenance. Currently, the database contains an inventory of the Trustee hydrocarbon sample collection and provides for retrieval of hydrocarbon analyses by principal investigators and managers. This project is designed to provide easy access to the Trustee hydrocarbon database and ensure the accuracy of the data. The volume of data contained in the database suggests that other users will benefit from access, particularly as more data is added (Chenega project; oiled mussel bed project, and pink salmon) and as more synthesis products are produced (salmon and

herring).

B. Rationale/Link to Restoration

Archiving of the Trustee hydrocarbon sample data will ensure that these data are available to principal investigators, government agencies, and the interested public on a timely basis. The database allows direct comparison of restoration and NRDA data, and contains an inventory of hydrocarbon samples and information about their collection, storage and analysis. The continued use of the methods for hydrocarbon data evaluation and interpretation developed for the *Exxon Valdez* NRDA samples will insure direct comparability of future with previous samples. This will substantially increase the probability that temporal trends in these data will be detected when actually present. Principal investigators will be able to get assistance with chemical interpretation of hydrocarbon results from their project or other projects that relate to their project when needed. Since most investigators are not chemists, this type of assistance is usually required for proper interpretation of hydrocarbon results. Application of the petroleum weathering model developed under this project (Short and Heintz, 1997) has been used to compare coal samples and Katalla seep with Prince William Sound background samples, and has identified coal as the “biologically non-available source, in contrast to researchers sponsored by EXXON, who have identified the source as Katalla seep oil.

C. Location

While this project resides at the Auke Bay Laboratory, Juneau , Alaska, the service provided serves the entire spill area.

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

Community involvement includes and extends beyond the spill area. Science centers, public schools, native corporations, universities, environmental organizations and other concerned groups will have access to the database with guidelines on how the data can be used.

PROJECT DESIGN

A. Objectives

1. Continue maintenance of the Trustee hydrocarbon database by updating the database with new information and continue the sample archiving procedures developed under NRDA.
2. Continue interpretation of hydrocarbon data, including new data produced for principal investigators and resources managers and for syntheses products as needed.
3. Maintain Pristane database for Trustee funded projects as well as maintains a Fatty Acid/Lipid Class Composition Database for Trustee funded projects located at Auke Bay Laboratory.

4. Provide a new software product for the publicly accessible database which includes hydrocarbon samples analyzed through 1999.
5. Extend the use of the petroleum weathering model by using it as a tool for identifying potential sources of petroleum that contribute to the background signal identified in Constantine Harbor.
6. Design a long-term archiving plan for the Trustee hydrocarbon database PWSOIL.

B. Methods

Data associated with hydrocarbon samples are added to the existing Trustee hydrocarbon database. The samples and data currently reside at the Auke Bay Laboratory of NMFS. Incoming samples are inventoried and stored in laboratory freezers, and sample collection information is entered into the database. Samples are released for hydrocarbon analysis after ABL receives a written request from the responsible project leader. Hydrocarbon data, reported by the analytical laboratory, are matched to the sample collection information and all the data are checked for errors and electronic copies are sent to principal investigators or other requesters. An updated version of the public release of the database will be developed in Visual Basic software using *Exxon Valdez* Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database 1989-1995 (EVTHD) as a template and will include data collected from Trustee funded projects including sampling and analytical quality control procedures .

The petroleum weathering model developed under this project has been used to reject the hypothesis that the hydrocarbons comprising the background PAH source are derived from the Katalla oil seep. Analysis of sediment and mussel samples collected from locations near the Katalla oil seep as well as coal deposits east of PWS supports the conclusion that PAH derived from coal characterize the background hydrocarbon signal (Short et al., 1999). We will continue to use this information and analyses when necessary to demonstrate the generality of the weathering model with other oil sources and the absence of a similar weathering process in coal.

The Auke Bay Laboratory will continue to keep all environmental samples collected for hydrocarbon analysis under all phases of the oil spill process frozen in locked storage.

The pristane database will be maintained in ACCESS software. Information from samples collected under Trustee project 195 will be combined with data from the Trustee hydrocarbon database where applicable to provide a complete data set of pristane related information.

The fatty acid/lipid class database will be generated in current database software.

C. Contracts and Other Agency Assistance

No contracts are anticipated

SCHEDULE

A. Measurable Project Tasks for FY00

Samples will be stored and data analyzed throughout fiscal year. Release of the updated public version of the database software: Exxon Valdez Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database 1989-1995.

B. Project Milestones and Endpoints

April 15: Annual report in the form of updated release of hydrocarbon data software.

The primary objective of this project is to provide an ongoing service, consequently there are few set milestone dates or endpoints.

C. Completion Date

This is an ongoing service project to be completed when samples are no longer collected for hydrocarbon analysis and the Trustee Council terminates this service.

PUBLICATIONS AND REPORTS

The public release of the hydrocarbon database for projects funded in FY98 will be available 15 April, 1999 in the form of the annual report.

PROFESSIONAL CONFERENCES

One meeting is required, an annual Quality Assurance Control meeting attended by ABL's Senior Analytical Chemist. The results of an international calibration exercise by participant is reviewed for the integrity and credibility of chemical analyses. This meeting usually occurs in the Washington D.C. area, and is sponsored by National Institute of Standards and Technology (NIST).

NORMAL AGENCY MANAGEMENT

NOAA/NMFS has statutory stewardship for most living marine resources; however, if the oil spill had not occurred, NOAA would not be conducting this project. NOAA/NMFS proposes to make a significant contribution (as stated in the proposed budget) to the operation of this project, making it truly cooperative.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This project is a continuation of NRDA database and chemical interpretation work.

EXPLANATION OF CHANGES IN CONTINUING PROJECTS

This ongoing service project has no significant project design or schedule differences from the project funded in FY98, it is a continuation of the same service. The project has been downsized, as the input volume has decreased somewhat, although interpretation services will probably increase.

PROPOSED PRINCIPAL INVESTIGATOR

Bonita D. Nelson
NMFS Auke Bay Laboratory
11305 Glacier Highway
Juneau, Alaska 99801
907-789-6071
907-789-6094
bonita.nelson@noaa.gov

PRINCIPAL INVESTIGATORS

Bonita D. Nelson

Education:

BS 1979, University of Illinois, Urbana (Ecology, Ethology , Evolution)
MS 1986, University of Alaska-Juneau (Fisheries)

Other Revelant Experience:

Database manager of the Trustee hydrocarbon data for 4 years. Responsibilities include: supervision of data entry of sample and analytical data; processing and dissemination of data after interpretation by chemist; database management including data retrieval for production of the public versions of the database. Nelson has designed and managed databases as well as analyzed data for the radio telemetry program at the Auke Bay Laboratory for 10 years.

Jeffrey W. Short

Education:

BS, 1972 University of California, Riverside (Biochemistry & Philosophy)
MS, 1982, University of California, Santa Cruz (Physical Chemistry)

Other Experience:

1989 - Present: Established and managed the hydrocarbon analysis facility at ABL to analyze hydrocarbon samples generated by the *Exxon Valdez* NRDA effort (about 20% of these samples were analyzed at ABL).

1989 - 1992 : Principal Investigator, Exxon Valdez project Air/Water #3; Determination of petroleum hydrocarbons in seawater by direct chemical analysis and through the use of caged mussels deployed along the path of the oil spill.

1991 - 1992 : Principal Investigator, Exxon Valdez project Subtitle #8 ; Development of computer-based statistical methods for global examination of sediment and mussel hydrocarbon

data produced for the Exxon Valdez NRDA effort for systematic bias, and for identification of probable sources of hydrocarbons. In addition, this project produced both hard-copy and computer display maps of all the sediment and mussel hydrocarbon data.

LITERATURE CITED

Short, J. W., K.A. Kvenvolden, P.R. Carlson, F. D. Hostettler, R. J. Rosenbauer, & B. A. Wright, 1999. Natural Hydrocarbon Background in Benthic Sediments of Prince William Sound, Alaska: Oil vs Coal. *Environ. Sci. Technol.* 33:34-42.

Short, J. W., and R. A. Heintz. 1997. Identification of *Exxon Valdez* oil in sediments and tissues from Prince William Sound and the Northwestern Gulf of Alaska based on a PAH weathering model. *Environ. Sci. Technol.* 31:2375-2384.